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## TUNA FISHING AT AMERICAN SAMOA, JANUARY-APRIL 1954

By Wilvan G. Van Campen\*

### BACKGROUND

In 1949 a company known as Island Packers, Inc., headed by Harold Gatty and financed by the Rockefeller interests, installed a small, modern tuna cannery in some former Navy buildings on the north shore of Pago Pago Bay, Tutuila Island, American Samoa. Attempts to supply this cannery with tuna by live-bait fishing and purse seining in Samoan and Fijian waters failed completely, and the plant was never



Fig. 1 - Japanese tuna boats and Samoan canoes in Pago Pago Bay. The tuna cannery occupies the right hand row of four buildings on the far side of the bay, with the supervisors' quarters at the extreme right.

operated except for 2 trial runs of about 3 tons of fish each. In 1952 the Department of the Interior, in the hope that the plant might somehow eventually make a contribution to Samoa's economy, purchased it to prevent its being dismantled and sold abroad. The Government first offered the cannery for lease in October 1952, but there were no bidders at that time. In May 1953 the Commissioner of Customs ruled that fish caught by foreign vessels could be landed and processed in American

\* Translator, Pacific Oceanic Fishery Investigations, U. S. Fish and Wildlife Service, Honolulu, T. H.; and scientific observer in Samoa during the first phase of this operation.

Samoa and the product shipped to the United States without payment of United States tariff duties. When a second invitation for bids was issued in July 1953, the Van Camp Sea Food Company, Terminal Island, California, bid for and obtained a 1-year lease with an option to extend for 5 years.

On January 26, 1954, the salmon freezer ship North Star (1,642 tons gross), chartered by Van Camp from the North Star Fisheries Company of Seattle, rendezvoused at Pago Pago with a fleet of seven Japanese tuna boats, all under contract to a Japanese wholesale and export firm, Tokyo Marine Products, Inc. (Tokyo Suisan Kogyo K. K.). The fleet comprised 3 steel boats of around 150 tons gross and 4 wooden boats of about 100 tons gross. Only one of these was a specialized tuna long liner, the other six being primarily live-bait boats ordinarily engaged in pole-and-line fishing for skipjack and albacore in Japanese waters, and long lining only during the winter as an off-season occupation.

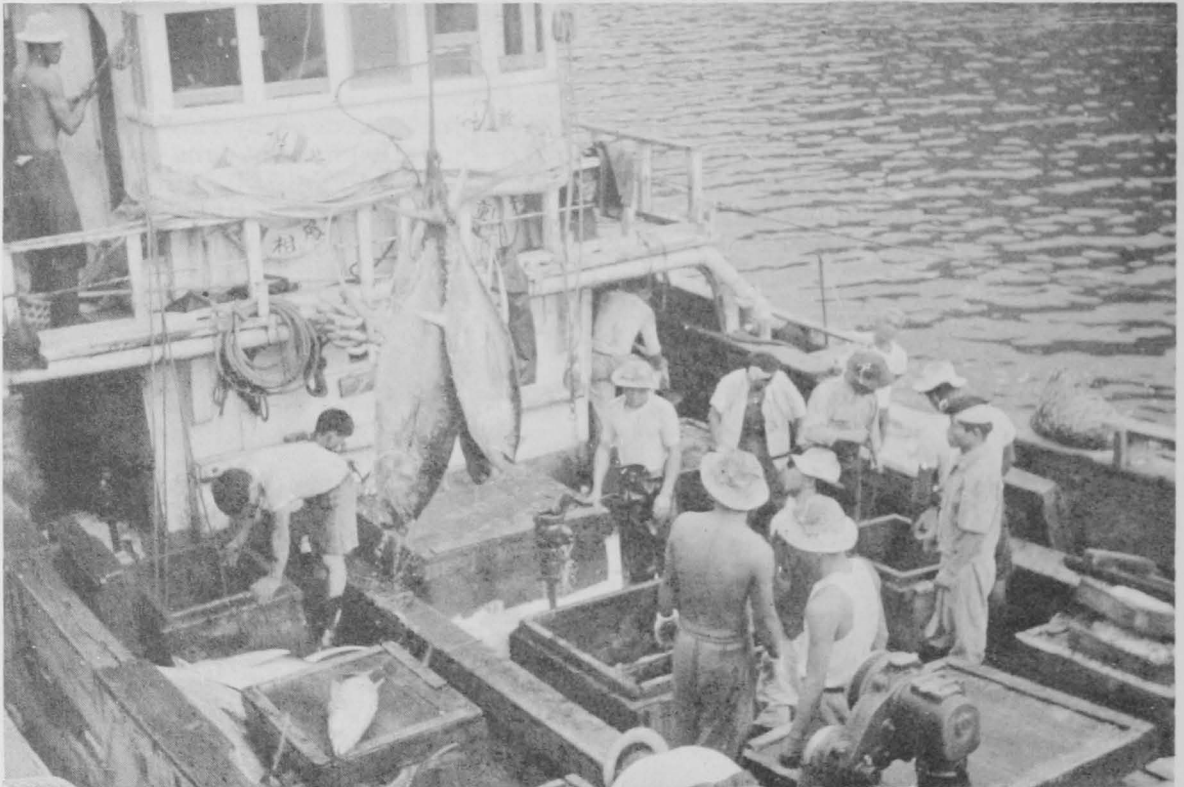


Fig. 2 - Bringing up tuna from the deck of a Japanese fishing boat to the United States freezer ship North Star, Pago Pago Bay, American Samoa.

The North Star remained in Pago Pago Bay until April 4, supplying the Japanese boats with ice, provisions, and part of their bait and fuel, and freezing the tuna brought in by them. The freezing of fish on the mothership went slowly, especially at first, and it never reached a high level of efficiency. Most of the time, using only 2 of the ship's 6 brine tanks, it took about 24 hours to freeze albacore and about 3 days to freeze large yellowfin.

On March 27 a second United States freezer ship, the Washington Star (649 tons), under charter to Tokyo Marine Products, arrived in Samoa to take over the duties of mothership, and on April 4 the North Star sailed for San Pedro with about 405 tons of frozen tuna. The fishing boats departed for Japan between March 30 and April 21, except for one with serious engine trouble which did not leave until May 10. The last day on which any fishing was done was April 11. The Washington Star sailed for Japan with a cargo of frozen marlin in the latter part of April.

The cannery was operated from February 8 until March 4, during which period it took mainly very large yellowfin tuna not considered worth exporting to the United States because of the operators' belief that such fish show a high incidence of dark-

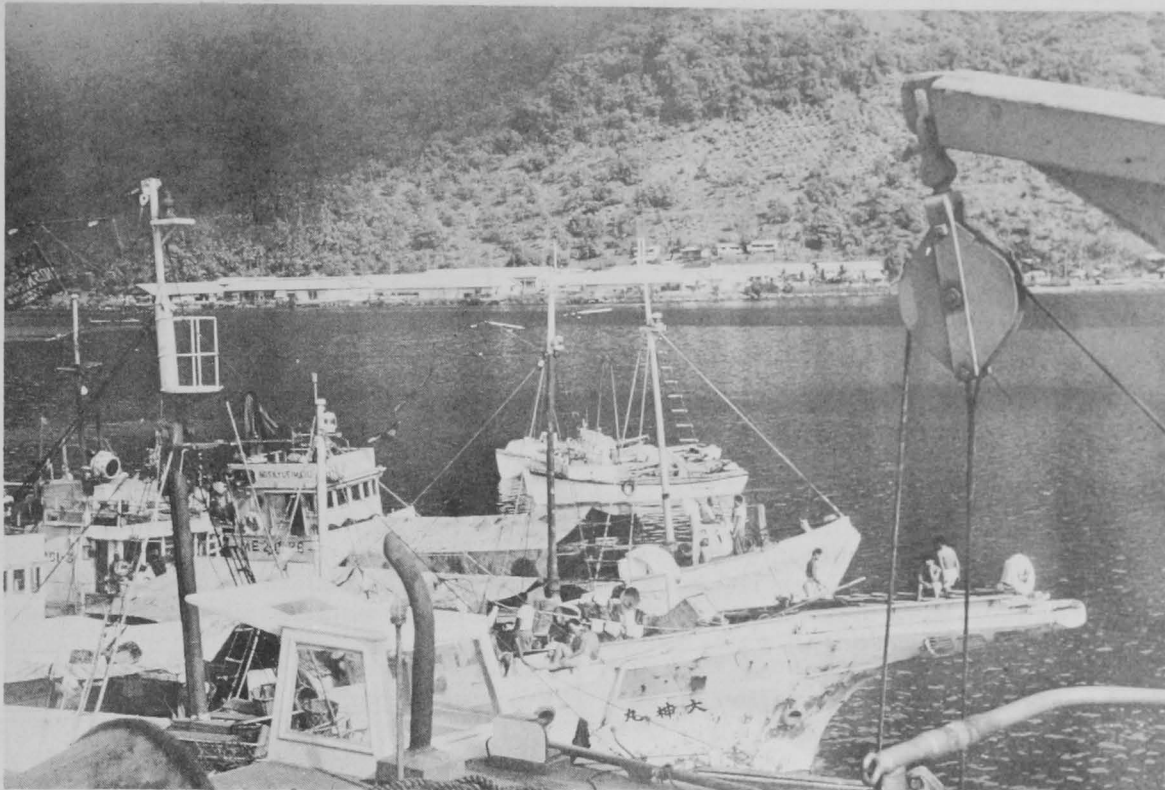


Fig. 3 - Japanese tuna boats alongside the North Star in Pago Pago Bay, with salmon gill-net boats in the middle background and cannery buildings across the bay.

colored and "green" flesh. The cannery ran again for 3 days early in April, when 3 of the fishing boats brought in fish after the North Star's departure.

### PRODUCTION

The fishing produced a total catch of some 583 tons of tuna; 444 tons of yellowfin, 131 tons of albacore, and  $8\frac{1}{2}$  tons of big-eyed and skipjack (table 1). The spear-

Table 1 - Tuna Landings at Pago Pago, American Samoa, by Species and Months, January 27 to April 14, 1954

Species	Month				Totals
	January	February	March	April	
	(Pounds)				
Yellowfin . . . . .	136,838	362,483	349,956	38,535	887,812
Albacore . . . . .	28,920	117,188	85,900	29,821	261,829
Big-eyed . . . . .	186	6,854	5,882	1,605	14,527
Skipjack . . . . .	467	1,162	775	-	2,404
Total . . . . .	166,411	487,687	442,513	69,961	1,166,572

fish catch, which was mostly black marlin, is estimated to have amounted to around 175 tons. Some 50 or 60 tons of this was lost through spoilage, a small quantity was sold locally as fresh fish, and the remainder was frozen aboard the Washington Star for shipment to Japan. Most of the fishing was done in the immediate vicinity of the main Samoan islands: of a total of 198 days of fishing for which positions were reported between January 26 and April 11, 125 days were spent in a 5-degree

(300-mile) square around the Samoan Islands. Three boats fished briefly in the Tonga area, two cruises were made to the waters north of Fiji, and there was scattered fishing at other locations (table 2). Because of the wide variation in the num-

Table 2 - Number of Days of Fishing and Average Catch Rates (Fish Per 100 Hooks) Reported from Each 5-degree Square (Identified by the Coordinates of the Northeast Corner) from January 26 to April 11, 1954

Square	General Area	No. of Days	No. of Fish/100 Hooks	
			Yellowfin	Albacore
10° S. - 170° W.	Samoa	125	2.02	1.28
15° S. - 170° W.	Northern Tonga	19	1.83	1.94
10° S. - 180° W.	North of Fiji	15	1.33	2.78
10° S. - 175° W.	West of Samoa	13	1.76	1.31
10° S. - 165° W.	Rose Island and Manu'a	7	1.71	0.83
20° S. - 170° W.	Central and southern Tonga	5	0.63	6.52
15° S. - 175° W.	East of Fiji	4	3.18	1.80
15° S. - 180° W.	Fiji	4	1.20	1.50
00° - 170° W.	Phoenix Island	4	1.83	0.97
00° - 180° W.	North of Ellice Island	1	1.24	1.31
20° S. - 175° W.	West of Tonga	1	1.93	2.67

ber of days of fishing in the several areas and the possibility that seasonal changes are involved, it is difficult to compare the areas in terms of abundance of fish. The average catch rates (fish per 100 hooks per day) in table 2 show no clearcut trend in the geographical distribution of the tunas except for the notably higher abundance of albacore in southern Tongan waters.

The abundance of both yellowfin and albacore, as reflected in the average catch rates of all vessels by 10-day periods (table 3), was moderately good during the first part of the operation, running around 3 fish per 100 hooks for either species in late January and early February, but this declined progressively until in the latter part of March the rates for both species were down to about 1. At best these catch rates are only mediocre in comparison with rates reported

Table 3 - Average Catch Rates of All Vessels Reporting by 10-Day Periods

Period	Number of Fish Per 100 Hooks	
	Yellowfin	Albacore
January 20-31	3.62	2.32
February 1-9	2.22	<u>1</u> /3.27
February 10-19	2.37	1.89
February 20-28	2.49	1.46
March 1-9	1.91	1.42
March 10-19	1.69	1.12
March 20-31	1.11	0.80
April 1-9	1.01	1.92
April 10-19	1.15	0.33

<sup>1</sup>/Includes a few high-catch days of fishing in Tongan waters.

Table 4 - Average Weight of Yellowfin Tuna in Single Fares

Date Landed	Weight in Pounds	
	Gutted Fish <sup>1</sup>	Round Fish
January 27	-	147.8
January 28	-	137.5
February 15	132.7	-
February 24	130.1	-
March 1	114.2	-
March 8	112.8	-
March 12	103.2	-
March 17	109.8	-
March 21	97.7	-
March 26	73.1	-
March 28	112.5	-
March 29	101.8	-

<sup>1</sup>/All yellowfin and big-eyed were delivered gutted and gilled after the first round of landings.

by the Japanese from other parts of the western Pacific, and they are decidedly inferior to the catch rates recorded in the equatorial central Pacific by U. S. Fish and Wildlife Service research vessels.

The apparent decrease in abundance was accompanied by a change in the size composition of the yellowfin catch. The average yellowfin weight dropped steadily from over 130 pounds in the early part of February to around 70 pounds in the latter part of March (table 4). In February, 70 percent of the yellowfin land-



ings were composed of fish over 120 pounds; in April only 24 percent were over that weight (table 5). This decrease in size, of course, lowered the "pay load" per day even more than is suggested by the drop in the numerical catch rates.

The Japanese fishermen advanced two hypotheses to account for the decline in the apparent abundance of fish: one, that there is a seasonal migration of tuna through Samoan waters, and that the early days of the operation chanced to coincide with this migration; and the other, that the fleet was exploiting a resident population of large fish, "home guards" that had settled down on the shoal areas around Samoa, and that this limited stock was severely depleted during the course of the operation. Only a continuation of fishing over the greater part of a year will show whether either of these notions is correct. It might be noted that in the first part of April, when there were no indications that the fishing had recovered around Samoa, one boat fishing off to the north of Fiji enjoyed fairly good albacore catch rates (3 to 4 fish per 100 hooks).

Period	Percentage over 120 Pounds
February	70
March 1-14	51
March 15-31	39
April	24

Sharks, usually an important element in the catch of Japanese tuna long liners, were not brought in by the boats since there was neither storage space nor transportation available for them. They seemed to be generally scarce in the waters fished by this fleet, and available data show shark damage to only about four percent of the tuna on the lines. The catch of tuna species other than yellowfin and albacore and of spearfishes other than black marlin was negligible.

All fishing was done with cotton long lines of standard Japanese design. The gear all had 5-hook baskets, typically with 180 fathoms of main line, a 13-fathom float line, and 12-fathom branch lines. The average number of baskets set per day by each vessel was about 290 and the maximum was 330. Setting was done between 0400 and 0800 hours, at the rate of 1 basket every 45 seconds, and the hauling of the gear took from around 1100 to 2100 hours or later, at the rate of 2 minutes per basket. Crews were 23 to 28 men, except on one of the large steel boats which carried 32.

Counting from the time when they first came alongside the North Star (complete records on the fishing done before that time are not available), six of the boats made four trips apiece and the seventh, which arrived late, made only three. The number of days fished per trip ranged from 3 to 12, the average being  $7\frac{1}{2}$ . For a total of 203 days of fishing included in this reckoning, the average daily catch was 1.70 tons of yellowfin and .53 ton of albacore.

One vessel fishing in Tongan Waters below  $20^{\circ}$  S. latitude early in February reported albacore catch rates as high as 8 and 9 fish per 100 hooks, and the albacore from that cruise averaged 50 pounds in weight as compared with an average of about 42 pounds in Samoan waters. Yellowfin were scarce that far south, however, and no further fishing was done there, either because it was more profitable to fish for heavy yellowfin farther north, or because the boats could not obtain the quantities of ice deemed necessary for such long trips.

#### SMALL BOAT EXPERIMENT

The North Star's complement included four experienced halibut fishermen, who were to make a trial of tuna fishing from 30-foot gasoline-powered motor boats of the type used for fishing salmon gill nets in Bristol Bay. Trolling was given a very brief trial from these boats at first, but with no success at all, and then imported ready-made Japanese long lines were fished, the main lines being reeled in on the hydraulically driven gill-net drums. Hauling by this method was so slow that a boat

could operate only about 30 baskets of 4-hook gear per day; that boats were not suitably built nor equipped to work on the open waters of the tropical Pacific; and there were repeated mechanical breakdowns. From January 30 to February 25, when the experiment was abandoned, sporadic fishing by two boats (four men) put a total of 5,756 pounds of tuna aboard the North Star.

### LOGISTICS

The major necessities of a Japanese long-liner fleet are ice, frozen bait, rice, and fuel. The motherships North Star and Washington Star undertook to supply the first three, which were practically unobtainable in Samoa, and also as much as possible of the fuel oil, as this was selling at Pago Pago for 14 cents a gallon plus a 3-cent-per-gallon handling charge (later waived under a retroactive agreement). The North Star brought 30,000 gallons of fuel from Seattle for the catcher boats, and when this was used up local supplies were drawn upon.

None of the fishing boats had any mechanical refrigeration, and only one of them, the sole specialized long liner, had any insulation on its fish holds; consequently ice in large quantities was essential to their operations. It is the customary practice of Japanese live-bait boats to leave their fish in the round and hold them in ice water rather than gut them and pack them in crushed ice, as is done on regular long-line boats. This ice water method requires about 1 ton of ice per day for each hold containing fish, and since a Japanese live-bait boat typically has 9 or 12 small fishholds (some of which double as bait tanks), ice consumption is very high. One of these boats will take 50 tons of ice for a 2-week trip. One of the regular long liners, working with a Japanese mothership, would require only about half that much ice. As evidence of this, the one specialized long liner working in Samoa, a 100-ton wooden vessel with three cork-insulated holds, was the only boat in the fleet that brought in a tonnage of fish greater than the tonnage of ice it consumed.

The North Star brought to Samoa 800 tons of ice in 400-pound blocks, which was all that could be loaded into her. A flake-ice machine mounted on the ship worked sporadically at a maximum rate of about 4 tons per day and contributed perhaps 160 tons in all. The 2 tons a day produced by the Samoan Government ice plant, except for the small quantities required for domestic purposes, was brought up and stockpiled by Van Camp Sea Food Company as a reserve supply and amounted to about 75 tons by the time the operation ended. The Washington Star brought from Honolulu 292 tons of ice in 300-pound blocks, arriving just in time to take over the task of icing the catchers for their trip home.

The Washington Star suffered heavy storm damage between the West Coast and Hawaii, and had to spend a whole month undergoing repairs in Honolulu. This made the date of her arrival with the supplementary ice supply uncertain, and measures had to be taken to stretch the obviously inadequate supply in the North Star. These measures took the form of an order to the fishing boat captains to bring in their fish packed in crushed ice rather than in ice water, and a rationing of ice deliveries to the boats at the rate of 30 tons per trip.

Before the arrival of the North Star, the fishing boats that had fish aboard bought small quantities of ice from the government plant at the usual price of \$20 a ton (Van Camp was later able to get this price cut in half for its bulk purchases). If this ice is counted in with that brought by the North Star and the flake ice made on the ship, it appears that in round figures nearly 1,000 tons of ice was used to produce less than 600 tons of tuna (leaving marlin out of consideration).

The bulk of the bait for the operation was 25 tons of frozen Japanese saury, shipped to Seattle expressly for this expedition and carried to Samoa aboard the North Star. The mothership also carried 10 tons of American herring, the Washington Star brought another 15½ tons of herring, and the fishing boats brought some saury

and a small quantity of sardine from Japan. There was no shortage of bait; indeed, the problem was to find satisfactory storage for it all. The poor catches made by some boats toward the end of the operation were blamed by some fishermen on the deterioration of their bait in storage. Saury was the preferred bait, and practically nothing else was used until the very end of the operation, when some boats that had used up their share of the saury took herring for the trip home.

The North Star carried 30 tons of rice and the Washington Star 10 tons. Both vessels also carried frozen vegetables and cigarettes for the fishing boats. The catchers supplied their own miso, soy, and other Japanese staples, and the fishermen traded fish for local produce, which is limited to such things as taro, breadfruit, bananas, and coconuts. Imported foodstuffs are high-priced and in poor supply at Pago Pago.

Berthing space in Pago Pago Harbor was just barely adequate for the fleet. The freezerships berthed at the Oil Dock and the fishing boats generally berthed at the Customs Pier. These berths are across the bay from the cannery, and all fish sent



Fig. 4 - Salmon gill-net boats at the Oil Dock, Pago Pago Bay, rigged for tuna fishing with trolling outriggers and with long lines reeled up on the net drums.

to the plant had to be trucked about 3 miles around the head of the bay. The cannery has two rather dilapidated small (50 x 22 feet) piers, one of which is being put into condition for use. There are no facilities capable of drydocking a tuna boat anywhere closer than Fiji. The docks at Suva are said to be quite adequate and the service reasonably inexpensive, but there is a great demand for the facilities and dock time must be reserved well in advance; in addition there are, of course, some formalities and attendant delays in the case of a foreign vessel. The government shops in Pago Pago are equipped to handle minor repair jobs, but major breakdowns can be taken care of only with difficulty.



## CANNERY

The cannery is located at Atu'u, across Pago Pago Bay from the largest town and seat of the Government of American Samoa. It is a well-equipped modern plant, with two packing lines and a capacity estimated at between 20 and 25 tons of tuna or 1,000 cases of the finished product per day. The largest amount of tuna sent to the plant on any one day during this operation was about 16

tons, and the average day's run was 7 to 8 tons. Almost all of the tuna sent to the cannery was yellowfin over 120 pounds, which was packed as chunk style, unless it was of darker color, in which case it was grated. Small experimental lots of other styles

were packed, and in the last 3 days of operation considerable quantities of albacore were received and put up as fancy solid pack (table 6).

Species	February	March	April	Totals
	(Pounds)			
Yellowfin, gutted	156,711	108,621	38,535	303,867
Yellowfin, round	42,599	-	-	42,599
Albacore, round	274	-	29,821	30,095
Big-eyed, gutted	2,483	1,639	1,605	5,727
Skipjack, round	365	40	-	405
Totals	202,432	110,300	69,961	382,693

The cannery has three Freon-refrigerated cold-storage rooms estimated to have a total tuna storage capacity of 60 tons. During this operation they were used for holding bait and provisions, and no tuna was stored in them. Construction of a flake-ice plant at the cannery was started in the middle of March and the plant was to go into operation in May. It has an ice-storage room of about 40 tons capacity insulated

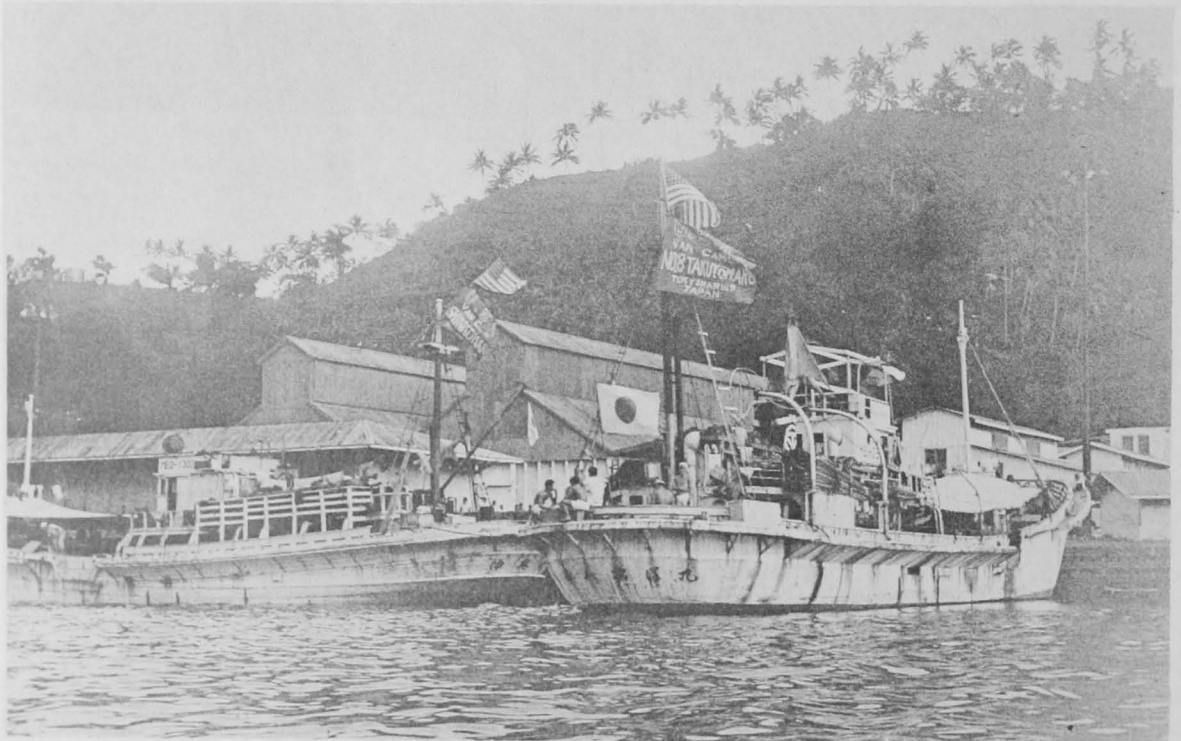


Fig. 5 - Japanese tuna boats at the Customs Pier in Pago Pago Bay, American Samoa, February 1954.

with aluminum foil and employs one belt icer operating off a  $7\frac{1}{2}$ " x  $7\frac{1}{2}$ " compressor and the flake-ice machine transferred from the North Star with two 6" x 6" compressors. Eventual installation of a 180-foot screw conveyor to carry the flake ice to the cannery pier is planned.



The cannery employed eight persons brought from the United States mainland in supervisory positions and about 160 local people, slightly more than half of them women occupied in cleaning and packing the cooked fish. Wage rates are in conformity with the scale used by the Government of American Samoa, which cooperates in the procurement of labor for the cannery. The Samoan workers were quick to learn their tasks and appeared reasonably efficient. In this connection it should also be noted that the agreement between the Samoan Government and the lessee provides that steps are to be taken to train Samoans in tuna fishing with a view to eventually using only local personnel in the production as well as in the processing end of the enterprise. No such training was undertaken during the period covered by this report.

Because of the large size of the long line-caught yellowfin, the cannery management anticipated considerable trouble with "green" and otherwise off-color fish. The actual occurrence of meat colors unsuitable for canning as bite-size light meat was as high as 20 to 30 percent in some batches of big tuna, but it was quite variable, being nearly absent from some batches, and the correlation between fish size and incidence of undesirable meat color was far from perfect. In general, the opinion of the operators seemed to be that the 20-percent discount on the price of fish over 120 pounds in weight was adequate to cover loss from this cause. Most of the fish rejected on this ground for chunk-style packing was satisfactory for canning as grated tuna, particularly if blended with a suitable proportion of lighter meat. Indications are that the amount of cooked fish rejected outright was small.

### CONCLUSIONS

The first phase of the experiment in operating the Samoan cannery with tuna from Japanese fishing boats demonstrated that (1) yellowfin tuna and albacore can be taken by long lines in the vicinity of Samoa, and (2) Samoan cannery labor can produce an acceptable pack of canned tuna. The economics of cannery operation in Samoa have not yet become clear. They no doubt depend on the apparent advantages of price and labor costs coupled with ready access to fishing areas around many island groups, from the yellowfin grounds along the equator to the possibly important albacore grounds below 20° S. latitude, as balanced against the logistical difficulties of working in this isolated, distant part of United States' Pacific territories.

The experiment is continuing. Reports from Samoa are that two more Japanese long liners began fishing out of Pago Pago in May, and another two in June. The operations of these vessels were reported to be going much more smoothly than those of the earlier, larger fleet. The fishing grounds continued for the most part to be within 50 miles of the main Samoan islands, and catches were at the level of 2 tons per vessel per day, about one-fourth of which was albacore.



### SEAWEED MEAL FOR COWS

It is reported that when lactating cows were fed a supplement of 200 grams of seaweed meal (dried milled *Ascophyllum nodosum*) per day for a period of 3 weeks to a month, an increased fat production was obtained.

--Journal of Scientific and Industrial Research, June 1953.